AF/GAU1754/$

EXPRESS MAIL NO. EM 508 445 769 US

Practitioner's Docket No. 142199

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Hard, Robert A.
Serial No.:	08/623,852
Filed:	03/26/1996
For:	Process for Recovering Metal Values from Solid Materials
Group No.:	1754
Examiner:	S. Bos

Assistant Commissioner for Patents
Attn. Box AF
Washington, D.C. 20231

TRANSMITTAL OF APPEAL BRIEF (PATENT APPLICATION—37 C.F.R. 1.192)

1. Transmitted herewith, in triplicate, is the APPEAL BRIEF in this application, with respect to the Notice of Appeal filed on October 6, 1998.

2. STATUS OF APPLICANT

This application is on behalf of other than a small entity.

3. FEE FOR FILING APPEAL BRIEF

Pursuant to 37 C.F.R. 1.17(c), the fee for filing the Appeal Brief is:

Other than a small entity	$300.00
Appeal Brief fee due	$ 300.00

4. EXTENSION OF TERM

The proceedings herein are for a patent application and the provisions of 37 C.F.R.1.136 apply.

Applicant petitions for an extension of time under 37 C.F.R. 1.136 (fees: 37 C.F.R. 1.17(a)(1)-(5)) for three months:

Fee	$ 870.00

If an additional extension of time is required, please consider this a petition therefor.

03/10/1999 AIBRAHIM 00000070 161435 08623852
02 FC:117 870.00 CH

	Extension fee due with this request	$ 870.00

5. TOTAL FEE DUE

The total fee due is:

Appeal brief fee	$ 300.00
Extension fee (if any)	$ 870.00
TOTAL FEE DUE	**$ 1170.00**

6. FEE PAYMENT

Charge Account No. 16-1435 the sum of $ 1170.00.

A duplicate of this transmittal is attached.

7. FEE DEFICIENCY

If any additional extension and/or fee is required, this is a request therefor and to charge Account No. 16-1435.

Date: 3/8/99

SIGNATURE OF PRACTITIONER

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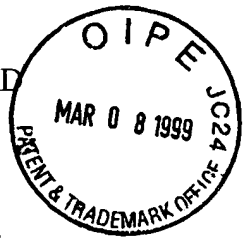
1 of 3

EXPRESS MAIL NO. EM 508 445 769 US

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE



#13/W.M. 3/18/99

In re Application of:	Robert A. HARD
Serial No.:	08/623,852
Filed:	March 26, 1996
For:	Process for Recovering Metal Values from Solid Materials
Examiner:	Bos, S.
Art Unit:	1754

APPEAL BRIEF

Assistant Commissioner of Patents
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Washington, DC 20231

Sir:

This is an Appeal Brief under 37 C.F.R. 1.192 in connection with the final rejection of claims 1-17 in the Final Office Action mailed May 6, 1998. Each of the topics required by 37 C.F.R. 1.192 is presented herewith and is labeled appropriately.

Real Party in Interest

The real party in interest in this patent application is the assignee, Cabot Corporation, 75 State Street, Boston, Massachusetts 02109 (hereinafter "Appellant").

Related Appeals and Interferences

The Appellant and the Appellant's legal representative know of no related appeals or interferences that will directly affect, will be directly affected by, or have a bearing on the Board's decision in this appeal.

Status of Claims

Claims 1-17 (shown in the Appendix) stand finally rejected. Claims 1-13 were rejected under 35 U.S.C. § 112, first and second paragraphs, and under 35 U.S.C. § 103(a). Claims 14-17 were rejected under 35 U.S.C. § 112, second paragraph. The final rejection of claims 1-17 is appealed.

Status of Amendments

Appellants have submitted an amendment after final rejection pursuant to 37 C.F.R. 1.116, filed contemporaneously with this Appeal Brief. The amendment seeks to modify the title of the invention and to amend claims 1 and 14. The Examiner has not acted upon this amendment. The claims shown in the appendix do not reflect the changes requested in the amendment after final rejection and are, thus, in the same form as they were when the Examiner finally rejected them.

Summary of the Invention

The present invention provides processes for separation and recovery of metal values, such as tantalum and niobium compounds, from metal containing materials such as ores, ore

residues and slags which include the metal values. Specification, page 1, line 38 to page 2, line 3.[1] The processes are advantageous for recovering metal values from depleted fluoridated solids remaining after the conventional processing of ores, concentrates or slags. In one embodiment, the present invention provides a process which enables the recovery of said metal values in a sulfuric acid solution without dissolution of significant amounts of uranium from said dilute solids. Spec., 2:3-6.

According to claim 1 or 14, a process for recovering metal values from metal containing material including metal values being recovered and additional metal values comprises: digesting the metal containing material in a sulfuric acid solution comprising sulfuric acid, a reducing agent and a carbon source for a period of time sufficient to solubilize the metal values being recovered and render the one or more additional metal values insoluble; heating the digestion mixture for a period of time sufficient to attain 75-95° C; and then separating the resulting solution from the remaining solids. Spec., 2:16-20. In one embodiment of the present invention, set forth in claim 2 or 15, the sulfuric acid solution also comprises hydrofluoric acid as a source of additional fluoride ions. Spec., 2:20-21.

The present invention is advantageous for a number of reasons. First, the process of the present invention utilizes sulfuric acid, which because of its stronger character can dissolve more starting metal containing materials, thus concentrating somewhat the residual radioactive elements in the undissolved solids and at the same time avoiding significant amounts of uranium. Spec., 2:31-35. Second, the use of sulfuric acid as the principal acidic media instead of

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[1] This brief will refer to pages and line numbers from the Specification in the following manner: Spec., 1:38-2:3. This example would refer the Board to the Specification from page 1, line 38 through page 2, line 3.

hydrofluoric acid results in the release of more of the tantalum and niobium from the starting metal containing material and thus gives better recovery of said metals. Spec., 2:36-3:2. A further advantage of the present invention is that the metal containing material solids which are treated according to the process of the present invention have improved environmental performance. Spec., 3:3-5.

The dependent claims 3-6, 10-13, 16 and 17are directed to particular embodiments of processes of the present invention and further specify features of the sulfuric acid solution. In these embodiments, the sulfuric acid solution comprises: 0.09 to 0.5, preferably 0.25 to 0.40, more preferably 0.33 pounds of concentrated sulfuric acid per pound of metal containing solids (dry basis); 0.01 to 0.08, preferably 0.02 to 0.03, more preferably 0.02 pounds of a reducing agent per pound of metal containing solids (dry basis); 0.01 to 0.08, preferably 0.02 to 0.03, more preferably 0.02 pounds of a carbon source per pound of metal containing solids (dry basis); and sufficient water to make a solution of 10 to 20%, preferably 11 to 15%, more preferably approximately 11% sulfuric acid in water. Spec., 4:16-26; Spec., 5:27-30. Suitable reducing agents in the sulfuric acid solution include reducing metals, in particular metal compositions including iron or aluminum. Spec., 5:16-17. Suitable carbon sources in the sulfuric acid solution include activated carbon, such as those used commercially in water treatment. Spec., 5:22-23. The sulfuric acid solution may additionally include 0.05 to 0.36, preferably 0.1 to 0.2, more preferably 0.12 pounds per pound of solids (dry basis) of at least 50%, preferably 70% hydrofluoric acid (HF) as a source of fluoride ion. Spec., 4:34-36; Spec., 5:31.

Further dependent claims 7-9 specify features of particular process steps. After digesting the metal containing material in the sulfuric acid solution at ambient temperature, the digestion

mixture may be heated to above 75° C, more preferably to 75-90° C for at least 0.5 hours, preferably 0.5 to 1 hours, more preferably about 0.5 hours. Spec., 4:27-29. The resulting mixture may then be cooled to below 70° C, preferably 50 to 70° C, more preferably 50 to 60° C. Spec., 4:30-31. The resulting solution may then be separated from the undissolved solids, preferably by filtering. Spec., 4:32-33. After the separation step, the separated undissolved solids may be washed with a volume of water equal to the volume of the resulting solution separated (the filtrate) and recycling the wash water into the sulfuric acid solution utilized in the digestion step. Spec., 5:8-13.

While not wishing to be bound by any theory, it is believed that under the process of the present invention, the tantalum and niobium, which are initially present in the metal containing material as fluorides, are dissolved in the sulfuric acid solution while the uranium, which has undergone air oxidation is reduced to a lower state of oxidation by the iron which is present in the sulfuric acid solution as a reducing agent. Spec., 3:29-32. The activated carbon in the sulfuric acid solution acts as a catalyst for the reduction process. Spec., 3:34-35. It is believed that the reducing agent reacts with certain metals, such as uranium, chromium and/or arsenic that may be present in the metal containing material to reduce the uranium, chromium and/or arsenic to lower oxidation states where they are less soluble. Spec., 3:29-4:4. As a result of the lowered solubility of the uranium, chromium and/or arsenic metal values, the amount of uranium, chromium and/or arsenic in the liquid phase is reduced, allowing enhanced recovery of other metal values, such as tantalum and/or niobium, solubilized by the sulfuric acid solution. Id. The presence of the small amount of free fluoride ion from the addition of hydrofluoric acid causes the uranium in the lower oxidation state to be precipitated, probably as UF_4. Spec., 3:32-34. It is

theorized that hydrogen gas, formed by the reaction of iron with the sulfuric acid is adsorbed on the carbon, where it is made available in a more reactive form to cause the reduction of U^{6+} to U^{4+} from which state it can react with fluoride ion to form the highly insoluble UF_4. Spec., 3:35-4:2.

Issues

The Examiner objected to the title of the invention stating that it was not descriptive. The Examiner finally rejected claims 1-13 under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The Examiner finally rejected claims 1-17 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner finally rejected Claims 1-13 under 35 U.S.C. § 103 (a) as being unpatentable over Bender et al., U.S. Pat. No. 5,232,490 (hereinafter "Bender") taken with Pazdej, U.S. Pat. No. 4,332,777 (hereinafter "Pazdej"). The issues presented for consideration in this appeal are:

1. Whether the Examiner erred in objecting to the title of the invention;

2. Whether the Examiner erred in rejecting claims 1-13 under 35 U.S.C. § 112, first paragraph, as containing new subject matter;

3. Whether the Examiner erred in rejecting claims 1-17 under 35 U.S.C. § 112, second paragraph, as being indefinite;

4. Whether the Examiner erred in rejecting claims 1-13 as being unpatentable under 35 U.S.C. § 103 (a) over Bender taken with Pazdej.

Grouping of Claims

Claims 1-13 stand and fall together as a group with respect to the § 103 (a) rejection under Bender taken with Pazdej, and with respect to the rejections under 35 U.S.C. § 112, first and second paragraphs. Claims 14-17 stand and fall together as a group with respect to the rejection under 35 U.S.C. § 112, second paragraph.

Argument

A. ISSUES 1-3

Issue 1: Whether the title of the invention is descriptive?
Issue 2: Whether claims 1-13 are patentable under 35 U.S.C. § 112, first paragraph, as containing subject matter that was disclosed in the specification?
Issue 3: Whether claims 1-17 are patentable under 35 U.S.C. § 112, second paragraph, as being definite?

Appellant respectfully asserts that Appellant has overcome, by amendment, the Examiner's objections to the title of the invention, to claims 1-13 under 35 U.S.C. § 112, first and second paragraphs, and to claims 14-17 under 35 U.S.C. § 112, second paragraph, in the contemporaneous amendment filed pursuant 37 C.F.R. 1.116. Appellant respectfully asserts that the filing of an amendment pursuant to Rule 116 does not constitute a waiver of Appellant's right to challenge, in this Appeal, the Examiner's rejection of the title and of claims 1-17 under § 112 in the event that the Examiner does not enter Appellant's Rule 116 amendment. Accordingly, Appellant attaches a copy of the contemporaneously-filed Rule 116 amendment and hereby

incorporates herein the arguments contained in the amendment in their entirety. Appellant further reserves the right to further address and expand upon these arguments in supplemental papers. See M.P.E.P. § 1206.

B. ISSUE 4

Issue 4: Whether Claims 1-13 are patentable under 35 U.S.C. § 103 (a) over Bender taken with Pazdej?

A claimed invention is not patentable "if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art." 35 U.S.C. § 103(a) (1994). The ultimate decision on obviousness is a "legal conclusion based on underlying factual inquiries including: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) objective evidence of nonobviousness." In re Huang, 40 USPQ2d 1685, 1687-88, 100 F.3d 135, 138 (Fed. Cir. 1996) (citing Graham v. John Deere Co., 148 USPQ 459, 467, 383 U.S. 1, 17-18 (1966)).

The present invention is directed to a process for recovering metal values, particularly tantalum and niobium metal values, from a metal containing material such as ores, ore residues, and slags which include the metal values, and in particular the depleted, fluoridated solids remaining after the conventional processing of ores, concentrates or slags. One aspect of the present invention involves digesting the metal containing material in a sulfuric acid solution in

the presence of a small amount of a reducing agent, such as iron, a carbon source, such as activated carbon, and a source of additional fluoride ion, such as hydrofluoric acid. The Examiner has rejected claims 1-13 under 35 U.S.C. § 103 (a) as being unpatentable over Bender et al., U.S. Pat. No. 5,232,490 (hereinafter "Bender") taken with Pazdej, U.S. Pat. No. 4,332,777 (hereinafter "Pazdej"). For the reasons set forth below, Bender taken with Pazdej fails to disclose or suggest the presently claimed process.

Bender relates to an oxidation/reduction process for the recovery of precious metals from refractory ores. Bender, Col. 1, lines 16-27.[2] The process disclosed by Bender comprises leaching a refractory ore "with a leach liquor comprising an acid selected from the group consisting of HCl and H_2SO_4 in the presence of a reductant and MnO_2 and maintaining a concentration of Cl^- ions in said leach liquor sufficient to substantially dissolve the precious metals." Bender, 4:60-66. When the precious metals are associated with MnO_2, Bender discloses the use of a carbonaceous reductant in the leach to reduce manganese in the form of MnO_2 to $MnCl_2$ or $MnSO_4$ which is soluble in the leach, thereby freeing the precious metal values from their association with MnO_2. Bender, 5:57-64.

Pazdej discloses a process for "the hydrometallurgical treatment of metallurgical dust, by leaching, with a view toward separation and recovery of the useful elements contained therein, namely zinc, lead or iron." Pazdej, 1:6-9. The metallurgical dust is leached in an acid solvent, generally sulfuric acid, and a solid-liquid separation follows. Pazdej, 1:28-31. "The leaching

[2] This brief will refer to columns and line numbers from patents in the following manner: Inventor name, Column:Line Numbers. The above citation would thus become Bender, 1:16-27.

takes place by attack of a moderate acid, that is to say that the pH of the solution at the end of reaction is about 4 or 5 . . . ." Pazdej, 1:31-34.

To establish a prima facie case for obviousness under 35 U.S.C. § 103 (a), an Examiner must meet three basic criteria. "First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations." Manual of Patent Examining Procedure § 2143. "In determining the propriety of the Patent Office case for obviousness in the first instance, it is necessary to ascertain whether or not the reference teachings would appear to be sufficient for one of ordinary skill in the relevant art having the reference before him to make the proposed substitution, combination, or other modification." In re Linter, 173 USPQ 560, 562, 458 F.2d 1013, 1016 (CCPA 1972). As will be discussed below, Appellant submits that a person of ordinary skill in the art would not be led or motivated to modify and/or combine the disclosures in Bender and Pazdej in order to reach the invention claimed in the present application.

In the final rejection mailed May 6, 1998, the Examiner stated that "Bender teaches the process of solubilizing metals from metal containing material by contacting with sulfuric acid containing a reducing agent and a carbon source." Office Action, May 6, 1998, p. 3. Appellant maintains that Bender contains no disclosure relating to a process for recovering metal values which utilizes a reducing agent and a carbon source which differs from the reducing agent. The Examiner noted that the claims of the present invention do not require that the reducing agent

and the carbon source be different materials. See Office Action, May 6, 1998, p. 4. However, Appellant has requested that its claims be amended to more specifically claim this aspect of the present invention pursuant to 37 C.F.R. 1.116. See Attached Copy of 37 C.F.R. 1.116 Amendment.

The Examiner also cited claim 36 of Bender as teaching "the use of a mixture of reductants, ie. reducing agents, which includes carbonaceous materials, ie. a carbon source, and another reducing agent, eg. sulfide materials." Office Action, May 6, 1998. Claim 36 of Bender discloses a process for recovery of precious metals from a precious metal-containing refractory ore or other refractory feed comprising precious metals "wherein said refractory feed comprises MnO_2 that is associated with said precious metals and said process comprises adding a reductant to said leach selected from the group consisting of sulfide materials, carbonaceous materials, and mixtures thereof." Bender, 55:12-16.

Although the term "mixtures" is not defined in the specification of Bender, it presumably refers to a raw material that is to be used as a reductant that contains both sulfide materials and carbonaceous materials. This interpretation is supported by the following quotation from Bender: "The reductant is preferably a raw mineral, as opposed to a reagent grade or otherwise processed or refined material. The reductant can be an ore, a mining waste or a milling waste . . . ." Bender, 8:45-48. Further, Bender does not teach or disclose the use of more than one reductant source at any point in the specification, including the examples. Thus, the term "mixtures thereof" as used in claim 36 likely refers to a raw mineral, such as an ore, a mining waste, or a milling waste, that contains both sulfide materials and carbonaceous materials.

The present invention also differs from Bender in its use of carbon. Carbonaceous materials are used as a *reductant* in Bender when the ore containing precious metals is an MnO_2 ore. See Bender, 5:28-31. In contrast, the carbon source in the present invention is used as a *catalyst* in the reduction of uranium initiated by a separate reductant, such as iron. "The activated carbon acts as a catalyst for the reduction process. It is theorized that hydrogen gas, formed by the reaction of iron with the sulfuric acid is adsorbed on the carbon, where it is made available in a more reactive form to cause the reduction of U^{6+} to U^{4+} from which state it can react with the fluoride ion to form the highly insoluble UF_4." Spec., 3:34-4:2. Since different materials are being reduced, uranium in the present invention and manganese in Bender, the role of carbon in the respective processes is also different.

The present invention also differs from Bender in relation to the operation of the reducing agent. The reducing agent in the present invention renders a metal value insoluble. See Claim 1. The reducing agent in combination with the carbon source reduces the uranium enabling it to react with fluoride ions in solution to form the highly insoluble UF_4. In short, the compound that is reduced forms a precipitate which can be separated from the leaching solution in the present invention. Conversely, the reducing agent in Bender reduces manganese from Mn^{4+} to Mn^{2+} enabling it to form $MnCl_2$ or $MnSO_4$, depending on the solution, which is soluble in the leach. See Bender, 5:60-64. The compound that is reduced and reacted in Bender is dissolved in the leach instead of being rendered insoluble. Thus, Bender does not teach or suggest a process wherein a reducing agent and carbon source are utilized in a sulfuric acid solution to produce

desirable metal values from a metal containing material while rendering undesirable metal values insoluble in the same solution.

Unlike the present invention, Bender does not teach or suggest the use of a sulfuric acid solution containing hydrofluoric acid. The Examiner even acknowledges this distinction. See Office Action, May 6, 1998, p. 3. However, the Examiner cited Pazdej as teaching the use of sulfuric acid and hydrofluoric acid to solubilize metals.

"[A]n examiner cannot establish obviousness by locating references which describe various aspects of a patent applicant's invention without also providing evidence of the motivating force which would impel one skilled in the art to do what the patent applicant has done." Ex Parte Levengood, 28 USPQ2d 1300, 1302 (Bd.Pat.App. & Interf. 1993). As an initial matter, it should be noted that Pazdej does not teach or suggest the use of a reducing agent or a carbon source. Further, there is nothing in Pazdej that teaches or suggests adding hydrofluoric acid as an additional source of fluoride ion to form an insoluble compound with undesirable metal values, which have been reduced by a reducing agent. The Examiner cited the claims of Pazdej as teaching the use of sulfuric acid and hydrofluoric acid to solubilize metals. See Office Action, May 6, 1998, p. 4. To the contrary, the claims of Pazdej never even mention hydrofluoric acid.

The claims of Pazdej only disclose the use of sulfuric acid to leach metallurgical dust wherein zinc is dissolved into sulfate form and insoluble particles of lead sulfate are formed. See Pazdej, Claim 1. Like the dissolution of zinc, the process of the present invention uses sulfuric

acid to dissolve metal values, such as tantalum and niobium. However, unlike Pazdej, other metal values, such as uranium, in the process of the present invention are reduced and react with the fluoride ions present in solution to form insoluble particles, such as UF_4. The compounds that precipitate in Pazdej are sulfates, such as lead sulfate.

The only disclosure in Pazdej that suggests the use of sulfuric acid and hydrofluoric acid is found in the figures. See Pazdej, Figures 1-2. The Pazdej figures show both a sulfuric acid and a hydrofluoric acid stream entering the leaching stage of the process. As noted above, the Pazdej specification does not indicate the function of the hydrofluoric acid stream.

The disclosure of Pazdej would not suggest to a person of ordinary skill in the art that hydrofluoric acid may be added to a sulfuric acid solution to place fluoride ions into solution in order to precipitate undesirable metal values. This is particularly true when the process also seeks to recover tantalum values and niobium values from a *fluoridated* solid. In summary, it would not be obvious to a person of ordinary skill in the art to add hydrofluoric acid to a sulfuric acid solution, which is being utilized for the recovery of metal values from a fluoridated solid, in order to precipitate other metal values, such as uranium.

"[I]t is impermissible to use the claimed invention as an instruction manual or 'template' to piece together isolated disclosures and teachings of the prior art so that the claimed invention may be rendered obvious." Ex parte Haymond, 41 USPQ2d 1218, 1220 (Bd.Pat.App. & Interf. 1996). As noted above, the use of hydrofluoric acid in the present invention would not be obvious to a person of ordinary skill in the art because the present invention seeks to recover

metal values from a fluoridic solid. In addition, the combination of Bender and Pazdej fails to suggest a process wherein a reducing agent and a carbon source are utilized in conjunction as contemplated by the present invention. Therefore, Appellant submits that claims 1-13 of the present invention are patentable under 35 U.S.C. § 103 (a) over Bender taken with Pazdej.

Conclusion

In view of the foregoing, it is submitted that the rejection of claims 1-17 is improper and should not be sustained. Therefore, a reversal of the Final Rejection of the Examiner is respectfully requested.

Respectfully submitted,

Date: 3/8/99

By: _____

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APPENDIX - Claims

1. A process for recovering metal values from a metal containing material including metal values being recovered and one or more additional metal values comprising:

digesting the metal containing material in a sulfuric acid solution comprising:

sulfuric acid;

a reducing agent to render a metal value insoluble; and

a carbon source;

for a period of time sufficient to solubilize the metal values being recovered and render the one or more additional metal values insoluble;

heating the digestion mixture for a period of time sufficient to attain 75-95° C; and

separating the resulting solution from the remaining solids.

2. The process of claim 1 wherein the sulfuric acid solution further comprises hydrofluoric acid as a source of fluoride ion.

3. The process of claim 1 wherein the sulfuric acid solution comprises:

0.09 to 0.4 pounds of concentrated sulfuric acid per pound of metal containing material solids (dry basis);

0.01 to 0.03 pounds of a reducing agent per pound of metal containing material solids (dry basis);

0.01 to 0.03 pounds of a carbon source per pound of metal containing material solids (dry basis); and

sufficient water to make a solution of 5 to 15% sulfuric acid in water.

4. The process of claim 3 wherein the sulfuric acid solution further comprises: 0.05 to 0.2, pounds of at least 50% hydrofluoric acid (HF) as a source of fluoride ion.

5. The process of claim 3 wherein the sulfuric acid solution comprises:

0.33 pounds of concentrated sulfuric acid per pound of solids (dry basis);

0.02 pounds of a reducing agent per pound of solids (dry basis);

0.02 pounds of a carbon source per pound of solids (dry basis) and

sufficient water to make a solution of 11% in sulfuric acid.

6. The process of claim 5 wherein the sulfuric acid solution further comprises: 0.12 pounds per pound of solids (dry basis) 70% hydrofluoric acid (HF) as a source of fluoride ion.

7. The process of claim 3 further comprising the step of cooling the heated digestion mixture and wherein:

the metal containing material is digested for at least 1 hour in the sulfuric acid solution;

the digestion mixture is heated to above 75° C, for at least 0.5 hour;

the resulting mixture is cooled to below 60° C;

and the resulting solution is separated by filtering.

8. The process of claim 4 further comprising the step of cooling the heated digestion mixture and wherein:

the metal containing material is digested for at least 1 hour in the sulfuric acid solution;

the digestion mixture is heated to above 75° C, for at least 0.5 hour;

the resulting mixture is cooled to below 60° C;

and the resulting solution is separated by filtering.

9. The process of claim 1 further comprising the following steps after the separation step:

washing the separated undissolved solids with a volume of water equal to the volume of the resulting solution separated (the filtrate) and

recycling the wash water into the sulfuric acid solution utilized in the digestion step.

10. The process of claim 3 wherein the reducing agent is iron.

11. The process of claim 4 wherein the reducing agent is iron.

12. The process of claim 3 wherein the carbon source is activated carbon.

13. The process of claim 4 wherein the carbon source is activated carbon.

14. A process for recovering metal values including tantalum metal values and niobium metal values from a source material comprising tantalum, niobium and uranium metal values, the process comprising:

digesting the source material in a sulfuric acid solution comprising:

sulfuric acid;

a reducing agent; and

an additive comprising carbon;

for a period of time sufficient to solubilize tantalum metal values and niobium metal values and form an aqueous phase comprising solubilized tantalum metal values and niobium metal values, and a solid phase comprising uranium metal values ;

heating the digestion mixture for a period of time sufficient to attain 75-95 °C; and

separating the resulting solution comprising tantalum metal values and niobium metal values from the remaining solids comprising uranium metal values.

15. The process of claim 14 wherein the sulfuric acid solution further comprises hydrofluoric acid.

16. The process of claim 14 wherein the reducing agent comprises iron, aluminum or mixtures thereof.

17. The process of claim 16 wherein the additive comprises activated carbon.